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10/522,604	01/26/2005	Masahiro Harada	2004-2027A	1652

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EXAMINER	
YOUNG, NATASHA E	

ART UNIT	PAPER NUMBER
1797	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/522,604	HARADA ET AL.	
	Examiner	Art Unit	
	NATASHA YOUNG	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 January 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *1,4,5 and 8-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4,5 and 8-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 4-5, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borsboom et al (US 4,981,661) in view of Forg et al (US 5,660,807), Kettner et al (US 4,857,297), and Messenger (WO 02/04389 A1).

Regarding claim 1, Borsboom et al discloses a COS treatment apparatus for a gasified gas containing H_2S, H_2O, O_2, and CO, which comprises: a first reactor (12) into which the gasified gas is to be introduced, the gas having a temperature of at least 300ºC; a second reactor (14) located at a downstream side of a gasified gas flow with respect to the first reactor (12); and wherein the first reactor comprises an O_2 removal catalyst and the second reactor comprises a COS conversion catalyst (see Abstract; figure 1; column 4, lines 37-41; and column 5, lines 28-68), which is capable of accelerating the following reaction:

$$2H_2S + 2CO + O_2 \rightarrow 2COS + 2H_2O.$$

Borsboom et al does not disclose that said O_2 removal catalyst consisting of TiO_2 and Cr_2O_3 or consisting of TiO_2 and NiO.

However, Borsboom et al discloses that the oxygen removal catalyst is Co-Mo catalyst (see column 5, lines 28-68).

Forg et al discloses a gas mixture is brought into contact with a catalyst which decomposes HCN by hydrogenation and/or by hydrolysis and COS that is contained in the gas mixture is decomposed at least partially in a catalyst by hydrolysis (see Abstract), a TiO_2 catalyst carrying Cr_2O_3 (see column 2, lines 32 through column 3, line 5), and simultaneously at least a large part of the COS that is contained in the gas

mixture is reacted by hydrolysis, and at the same time the new formation of COS from H_2S and CO_2 is suppressed (see column 2, lies 42-48).

Kettner et al discloses that it was known in the art to use TiO_2 as a catalyst in destroying COS and CS_2 (see column 3, lines 25-43).

Messenger discloses that Cr_2O_3 catalyst exhibits a distinctive boundary between the oxidizing environment at the front of the catalyst and the reducing environment at the rear of the reactor such that the majority of the oxygen is consumed at the front end of the catalyst to crack the hydrocarbon feed (see page 2, lines 12-24).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Forg et al with the teachings of Kettner et al and Messenger such that the TiO_2 catalyst carrying Cr_2O_3 of Forg et al may be used as an O_2 removal catalyst to remove contaminants like oxygen and COS since Cr_2O_3 is effective in removing oxygen (see Messenger page 2, lines 12-24) and TiO_2 is effective in removing COS (see Kettner et al column 3, lines 25-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Borsboom with the teachings of Forg et al, Kettner et al, and Messenger such that said O_2 removal catalyst is a TiO_2 catalyst carrying Cr_2O_3 in order that the catalyst system may be used for more effective removal of contaminants like oxygen and COS since Cr_2O_3 is effective in removing oxygen (see Messenger page 2, lines 12-24) and TiO_2 is effective in removing COS (see Kettner et al column 3, lines 25-43).

Regarding claim 4, Borsboom et al discloses a COS treatment apparatus wherein said O_2 removal catalyst is located in a higher-temperature region with respect to said COS conversion catalyst (see column 2, lines 39-55).

Regarding claim 5, Borsboom et al discloses a COS treatment method for a gasified gas containing H_2S, H_2O, O_2, and CO, which comprises a first step of removing O_2 and SO_2 to form steam and H_2S and the temperature of the gas supplied to the first step will generally be at least 200ºC, and a second step which catalyses the hydrolysis with steam of COS and CS_2 to form carbon dioxide and H_2S at a temperature of at least 275ºC (see Abstract; figure 1; column 2, lines 39-55; column 4, lines 37-41; and column 5, lines 28-68), which is capable of accelerating the following reaction:

$$2H_2S + 2CO + O_2 \rightarrow 2COS + 2H_2O\,.$$

Borsboom et al does not disclose that said O_2 removal catalyst is a TiO_2 catalyst carrying Cr_2O_3 or NiO.

However, Borsboom et al discloses that the oxygen removal catalyst is Co-Mo catalyst (see column 5, lines 28-68).

Forg et al discloses a gas mixture is brought into contact with a catalyst which decomposes HCN by hydrogenation and/or by hydrolysis and COS that is contained in the gas mixture is decomposed at least partially in a catalyst by hydrolysis (see Abstract), a TiO_2 catalyst carrying Cr_2O_3 (see column 2, lines 32 through column 3, line 5), and simultaneously at least a large part of the COS that is contained in the gas mixture is reacted by hydrolysis, and at the same time the new formation of COS from H_2S and CO_2 is suppressed (see column 2, lies 42-48).

Kettner et al discloses that it was known in the art to use TiO_2 as a catalyst in destroying COS and CS_2 (see column 3, lines 25-43).

Messenger discloses that Cr_2O_3 catalyst exhibits a distinctive boundary between the oxidizing environment at the front of the catalyst and the reducing environment at the rear of the reactor such that the majority of the oxygen is consumed at the front end of the catalyst to crack the hydrocarbon feed (see page 2, lines 12-24).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Forg et al with the teachings of Kettner et al and Messenger such that the TiO_2 catalyst carrying Cr_2O_3 of Forg et al may be used as an O_2 removal catalyst to remove contaminants like oxygen and COS since Cr_2O_3 is effective in removing oxygen (see Messenger page 2, lines 12-24) and TiO_2 is effective in removing COS (see Kettner et al column 3, lines 25-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Borsboom with the teachings of Forg et al, Kettner et al, and Messenger such that said O_2 removal catalyst is a TiO_2 catalyst carrying Cr_2O_3 in order that the catalyst system may be used for more effective removal of contaminants like oxygen and COS since Cr_2O_3 is effective in removing oxygen (see Messenger page 2, lines 12-24) and TiO_2 is effective in removing COS (see Kettner et al column 3, lines 25-43).

Regarding claim 8, Borsboom et al discloses a COS treatment wherein said removing O_2 from the gas is performed at a higher temperature with respect to said converting COS to H_2S (see column 2, lines 39-55).

Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borsboom et al (US 4,981,661) in view of Tang et al (US 6,019,954) and Forg et al (US 5,660,807).

Regarding claim 9, Borsboom et al discloses a COS treatment apparatus for a gasified gas containing H_2S, H_2O, O_2, and CO, comprising: a reactor (12) into which the gasified gas is to be introduced, the reactor comprising an O_2 removal catalyst for accelerating the following reaction:

$2H_2S + 2CO + O_2 \rightarrow 2COS + 2H_2O$ (see Abstract; figure 1; and column 5, lines 28-68).

Borsboom et al does not discloses the reactor comprising a TiO_2 catalyst carrying Cr_2O_3 and BaO, wherein the TiO_2 catalyst carrying Cr_2O_3 and BaO is an O_2 removal catalyst and wherein the TiO_2 catalyst carrying Cr_2O_3 and BaO is a COS conversion catalyst.

However, Borsboom et al discloses that the oxygen removal catalyst is Co-Mo catalyst (see column 5, lines 28-68).

Tang et al discloses Co-Mo system catalyst supported over a TiO_2-containing carrier for the conversion of carbon monoxide with steam into carbon dioxide and hydrogen (see column 1, lines 9-18) and said catalyst comprises a carrier having TiO_2, at least one catalytically active metal compounds selected from the group consisting of oxides and sulfides of Co, Ni, Mo, and W, and optionally promoters selected from the groups consisting of compounds of rare earth element, alkali earth metals which includes barium, Cu, Zn, and Mn (see column 2, lines 24-39).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Borsboom et al with the teachings of Tang et al such that said O_2 removal catalyst is a TiO_2 catalyst carrying the Co-Mo catalyst in order to improve the conversion of carbon monoxide with steam into carbon dioxide and hydrogen.

In addition, Forg et al discloses a gas mixture is brought into contact with a catalyst which decomposes HCN by hydrogenation and/or by hydrolysis and COS that is contained in the gas mixture is decomposed at least partially in a catalyst by hydrolysis (see Abstract), a TiO_2 catalyst carrying Cr_2O_3 or NiO (see column 2, lines 32 through column 3, line 5), and simultaneously at least a large part of the COS that is contained in the gas mixture is reacted by hydrolysis, and at the same time the new formation of COS from H_2S and CO_2 is suppressed (see column 2, lies 42-48).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Borsboom et al and Tang et al such that the reactor comprising a TiO_2 catalyst carrying Cr_2O_3 and BaO, wherein the TiO_2 catalyst carrying Cr_2O_3 and BaO is an O_2 removal catalyst and wherein the TiO_2 catalyst carrying Cr_2O_3 and BaO is a COS conversion catalyst in order that the catalyst system may be used for the decomposition of HCN by hydrogenation and/or hydrolysis and COS is decomposed at least partially by hydrolysis.

Regarding claim 10, Borsboom et al discloses a COS treatment method for a gasified gas containing H_2S, H_2O, O_2, and CO, which comprises a first step of removing O_2 and SO_2 to form steam and H_2S, and a second step which catalyses the hydrolysis

with steam of COS and CS_2 to form carbon dioxide and H_2S (see Abstract; figure 1; column 2, lines 39-55; and column 5, lines 28-68), which is capable of accelerating the following reaction:

$$2H_2S + 2CO + O_2 \rightarrow 2COS + 2H_2O.$$

Borsboom et al does not disclose removing O_2 from the gas by using a TiO_2 catalyst carrying Cr_2O_3 and BaO and simultaneously converting COS to H_2S by using the TiO_2 catalyst carrying Cr_2O_3 and BaO.

However, Borsboom et al discloses that the oxygen removal catalyst is Co-Mo catalyst (see column 5, lines 28-68).

Tang et al discloses Co-Mo system catalyst supported over a TiO_2-containing carrier for the conversion of carbon monoxide with steam into carbon dioxide and hydrogen (see column 1, lines 9-18) and said catalyst comprises a carrier having TiO_2, at least one catalytically active metal compounds selected from the group consisting of oxides and sulfides of Co, Ni, Mo, and W, and optionally promoters selected from the groups consisting of compounds of rare earth element, alkali earth metals which includes barium, Cu, Zn, and Mn (see column 2, lines 24-39).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Borsboom et al with the teachings of Tang et al such that said O_2 removal catalyst is a TiO_2 catalyst carrying the Co-Mo catalyst in order to improve the conversion of carbon monoxide with steam into carbon dioxide and hydrogen.

In addition, Forg et al discloses a gas mixture is brought into contact with a catalyst which decomposes HCN by hydrogenation and/or by hydrolysis and COS that is contained in the gas mixture is decomposed at least partially in a catalyst by hydrolysis (see Abstract), a TiO_2 catalyst carrying Cr_2O_3 or NiO (see column 2, lines 32 through column 3, line 5), and simultaneously at least a large part of the COS that is contained in the gas mixture is reacted by hydrolysis, and at the same time the new formation of COS from H_2S and CO_2 is suppressed (see column 2, lies 42-48).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Borsboom et al and Tang et al such that removing O_2 from the gas by using a TiO_2 catalyst carrying Cr_2O_3 and BaO and simultaneously converting COS to H_2S by using the TiO_2 catalyst carrying Cr_2O_3 and BaO in order that the catalyst system may be used for the decomposition of HCN by hydrogenation and/or hydrolysis and COS is decomposed at least partially by hydrolysis.

Response to Arguments

Applicant's arguments filed January 5, 2009 have been fully considered but they are not persuasive.

The applicants argue that the Co-Mo catalyst disclosed in Borsboom is not an O_2 catalyst which is capable of accelerating the reaction.

The examiner disagrees.

Borsboom discloses a reactor (11) filled with a Co-Mo catalyst, which is capable of hydrogenating contaminants in the supply gas, such as oxygen and sulfur dioxide, to form steam and hydrogen disulfide (see column 5, lines 27-68) such that the Co-Mo is interpreted as an oxygen catalyst (oxygen removal catalyst), since the oxygen and other contaminants react in the presence of the catalyst to form steam and hydrogen disulfide.

This is reinforced by Taylor et al (US 5,059,303), which discloses crude shale oil and hydrogen are reacted over a catalyst bed at an elevated temperature and pressure to effect olefin and aromatic bond saturation, removal of metal, sulfur, nitrogen and oxygen from the oil and typical catalytic hydrotreating catalyst used included Co-Mo (see column 1, line 46 through column 2, line 6) such that Co-Mo is an oxygen removal catalyst.

The applicants argue that none of the prior art references discloses a TiO_2 catalyst carrying Cr_2O_3 and BaO.

The examiner agrees, but the examiner believes that the combined teachings of the prior art disclose the claimed TiO_2 catalyst carrying Cr_2O_3 and BaO.

However, Tang et al discloses Co-Mo system catalyst supported over a TiO_2-containing carrier for the conversion of carbon monoxide with steam into carbon dioxide and hydrogen (see column 1, lines 9-18) and said catalyst comprises a carrier having TiO_2, at least one catalytically active metal compounds selected from the group consisting of oxides and sulfides of Co, Ni, Mo, and W, and optionally promoters

selected from the groups consisting of compounds of rare earth element, alkali earth metals which includes barium, Cu, Zn, and Mn (see column 2, lines 24-39).

In addition, Forg et al discloses a gas mixture is brought into contact with a catalyst which decomposes HCN by hydrogenation and/or by hydrolysis and COS that is contained in the gas mixture is decomposed at least partially in a catalyst by hydrolysis (see Abstract), a TiO_2 catalyst carrying Cr_2O_3 or NiO (see column 2, lines 32 through column 3, line 5), and simultaneously at least a large part of the COS that is contained in the gas mixture is reacted by hydrolysis, and at the same time the new formation of COS from H_2S and CO_2 is suppressed (see column 2, lies 42-48).

Applicant's arguments with respect to claims 1 and 4-5 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATASHA YOUNG whose telephone number is 571-270-3163. The examiner can normally be reached on Mon-Thurs 7:30 am-6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Walter D. Griffin/
Supervisory Patent Examiner,
Art Unit 1797

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